

REMARKS

Withdrawal of Claim 25

The Examiner has stated in the office action that independent method claim 25, newly submitted in the preliminary amendment filed on January 2, 2009, is directed to an invention that is independent or distinct from the invention originally claimed in this application and is withdrawn from consideration as being directed to a non-elected invention. The basis for the Examiner's contention in this regard is that claim 25 includes further limitations not included in the prior method claims which would require further consideration and search.

The applicant respectfully disagrees with the Examiner's position in this regard. To expedite prosecution, however, applicant has canceled claim 25 without prejudice and has introduced new method claim 26. Claim 26 recites simply a method of producing a polyethylene oxide having a specified molecular weight range, in which ethylene oxide is polymerized by using a catalyst composition according to claim 13. Moreover, the weight range specified in new claim 26 for the polyethylene oxide produced by the claimed method is identical to the weight range identified in claim 13 for polyethylene oxide produced using the novel catalyst composition claimed therein.

It is thus clear that new claim 26 does not introduce any new limitations that would require further consideration or search on the part of the Examiner.

Method claims 21-24, previously dependent on claim 25, have been made dependent on new claim 26.

Rejection of Claims 13, 16-19 and 21-24 under 35 U.S.C. §102(b)

The Examiner has rejected claims 1-7 under 35 U.S.C. §102(b) as being anticipated by Patton et al. (U.S. 3,321,533). This rejection is respectfully traversed, and reconsideration and withdrawal of the same is requested.

Patton et al. disclose a process for producing “surface active agents which are... *low molecular weight polymers wherein from 2 to 20 and preferably from 3 to 10 alkylene oxide units, e.g., ethylene oxide units, form the longest chain*” (col. 2, lines 3-7; emphasis added). In this preparation process, the desired ratios of alkylene oxide are reacted with “aluminum alkyl *of reduced catalytic activity*” (col. 2, lines 7-9; emphasis added). Patton et al. emphasize the need to use only aluminum alkyl of reduced catalytic activity in the disclosed process because, otherwise:

“the products are high molecular weight polymers wherein about 500 or more alkylene oxide units have combined to form a single chain.
Such products are not suitable as surface active agents, even after hydrolysis to remove the metal.”

(col. 2, lines 11-16; emphasis added). In addition, the products of the Patton et al. process are surface active agents including a hydrophobic alkyl portion and a hydrophilic polyoxyalkylene portion.

By direct contrast, the claimed catalyst composition of amended claim 13 is a combination consisting of **two** components, a trialkylaluminum (or tricycloalkylaluminum) compound plus an alkali metal alkoxide compound (such as potassium t-butoxide) not disclosed or suggested by Patton et al. Further, applicant’s two-component catalyst composition is *not* of reduced catalytic activity as required by Patton; on the contrary, it is used (as recited in claim 13), to produce

exactly the type of high molecular weight (20,000-200,000) polymers of hundreds or thousands of ethylene oxide units that Patton et al.'s process avoids producing because they are "not suitable as surface active agents." Applicant's claimed catalyst is eminently suitable for its purpose, however, which is very different from that of the Patton process – namely, the homopolymerization of ethylene oxide to produce a polyethylene having a molecular weight range from 20,000 to 200,000.

Moreover, by the Patton et al. process, the aluminum alkyl $R'-Al-(R)R'$ is used as a starting material (Formula (II) in col. 2). This compound is oxidized into $R'O-Al-(OR)OR'$, which is then reacted with lower alkylene oxide in the presence of a basic hydroxide to produce a metal alkyl polyoxyalkylene compound $Al[O(-R'-O)_nR]R''_2$ (compound represented by Formula (III) in col. 3). Finally, this compound is hydrolyzed to obtain a nonionic surfactant represented by Formula (I) in col. 1, $(R)-(O-R''')_n OH$ (wherein R represents a higher alkyl group or an aralkyl group; and R''' represents a lower alkylene group). Thus, in the Patton process, trialkylaluminum functions as a **starting material**, not a catalyst, in producing the desired final surfactant product. Indeed, the hydrophobic alkyl moiety remaining in the final product is the residue of the trialkylaluminum starting material. In the present invention the trialkylaluminum compound is one component of a **catalyst** used in the polymerization of ethylene oxide, which, like any catalyst, remains unchanged by the polymerization reaction.

The following table summarizes some of the key differences between the instant invention claimed in amended claim 13 and the process and materials disclosed by Patton et al.:

Amended Claim 13	Patton et al. (U.S. 3,321,533)
Claimed invention is catalyst composition for use in <u>homopolymerization of ethylene oxide</u>	Discloses process for producing <u>surface active agents</u> including a hydrophobic alkyl portion and a hydrophilic polyoxy alkylene portion
Alkylaluminum used as one component of a <u>catalyst composition</u> in polymerization process; catalyst is unchanged during process	Alkylaluminum used as <u>starting material</u> in polymerization process; this starting material provides the hydrophobic alkyl moiety present in finished product
Alkylaluminum forms part of catalyst composition intended to provide <u>high catalytic activity</u>	Alkylaluminum used must be “ <u>of reduced catalytic activity</u> ”
<u>Alkali metal alkoxide must be present</u> as second component of catalyst composition	<u>No alkali metal alkoxide</u> used in process
Process in which catalyst composition is used is for producing polyethylene oxide polymers having a <u>molecular weight range from 20,000 to 200,000</u>	Process disclosed is for producing <u>low molecular weight surface active agents</u> wherein <u>from 2 to 20 alkylene oxide units</u> form the longest chain (“high molecular weight polymers wherein about 500 or more alkylene oxide units have combined to form a single chain ... are <u>not suitable</u> as surface active agents”)

Newly submitted method claim 26 is likewise distinguishable from Patton et al. in that it recites a process for producing a polyethylene having a molecular weight range from 20,000 to 200,000 (with far more than the maximum of 20 alkylene oxide units allowed by Patton et al. for their surfactant) using the two-component catalyst (not starting material) of claim 13, which material includes an alkali metal alkoxide not disclosed in Patton et al.

Hence, the Patton et al. reference not only fails to anticipate applicant’s presently claimed invention, it would not have suggested or rendered obvious applicant’s invention (intended for a different purpose and to achieve a very different end product than disclosed in Patton) to a

worker of ordinary skill in the art at the time the invention was made. Independent claims 13 and 26 thus patently distinguish over Patton et al.

Rejection of Claims 13, 16-19 and 21-24 under 35 U.S.C. §103(a)

The Examiner has rejected claims 13, 16-19 and 21-24 under 35 U.S.C. §103(a) as being unpatentable over Japanese Laid-Open Patent Publications No. 2000-256457 or No. 2002-293915 or No. 2002-128886. This rejection is respectfully traversed, and reconsideration and withdrawal of the same is requested.

To summarize the disclosures of the cited Japanese references:

JP-2000-256457 discloses a catalyst composition for the polymerization of propylene oxide, comprising **a crown ether compound**, an alkali metal alkoxide or an alkali metal hydroxide, and **an organic Lewis acid**, and a process for preparing a propylene oxide polymer using the catalyst, similar Ref. No. 4. In paragraph 0008, potassium t-butoxide is exemplified as an alkali metal alkoxide for polymerization of propylene oxide.

JP-2002-293915 discloses a catalyst composition for the polymerization of propylene oxide, comprising **a crown ether compound**, an alkali metal alkoxide or hydroxide or trialkyl silanoate, and a trialkyl aluminum compound and/or a triaryl aluminum compound, wherein the molar ratio among the three components is within a specific range, and a process for preparing a propylene oxide polymer using the catalyst. In claim 3, potassium t-butoxide is exemplified as an alkali metal alkoxide for polymerization of propylene oxide.

JP-2002-128886 discloses a catalyst composition for the polymerization of propylene oxide, comprising **a crown ether compound**, an alkali metal alkoxide or an alkali metal hydroxide,

a **polyether polyol** having a specific number average molecular weight, and a trialkyl aluminum compound, and a process for preparing a propylene oxide polymer using the catalyst. In claim 3, potassium t-butoxide is exemplified as an alkali metal alkoxide for polymerization of propylene oxide.

All of the catalyst compositions disclosed in the cited Japanese references are intended for use in the polymerization of propylene oxide and comprise, as an essential component, a crown ether into which an alkali metal ion can be incorporated. The compositions disclosed in JP-2000-256457 further comprise a Lewis acid, and the compositions disclosed in JP-2002-128886 further comprise a polyether polyol having a specific number average molecular weight, as essential components. On the other hand, the catalyst composition of the present invention as claimed in amended claim 13 does not contain any crown ether. Moreover, claim 13 recites that applicant's catalyst composition "consists of" components A and B identified therein, and excludes the presence in the catalyst not only of crown ethers but also of polyol ethers and Lewis acids as well.

An individual of ordinary skill in the art at the time the present invention was made, aware of the disclosures of the cited Japanese references, would have had no teaching, suggestion or motivation to prepare a catalyst composition containing a trialkylaluminum or tricycloalkylaluminum compound and an alkali metal alkoxide and to use that catalyst composition to polymerize even propylene oxide (much less ethylene oxide) in the absence of crown ethers, polyether polyols and Lewis acids. Furthermore, said skilled individual would have had no basis for expecting that the use of a catalyst composition as recited in the present claim 13 (and in method claim 26) could achieve direct polymerization of ethylene oxide to produce polyethylene oxide

having a molecular weight within the range of 20,000 to 200,000 in a high yield, as discovered and claimed by applicant.

In short, it would not have been obvious to one of ordinary skill in the art to prepare applicant's two-component catalyst composition for the polymerization of ethylene oxide, to use that composition in a direct polymerization process intended to produce polyethylene oxide having a molecular weight within the range of 20,000 to 200,000, or to expect that employing such a catalyst composition would economically provide a high yield of polyethylene in the desired weight range.

In light of the amendments of the claims and the remarks set forth above, it is respectfully submitted that independent claims 13 and 26 and all claims dependent thereon are in condition for allowance.

Petition is hereby made for a one-month extension of the period to respond to the outstanding Official Action to June 2, 2009. The Commissioner is hereby authorized to charge the \$65.00 extension fee to Deposit Account No. 11-1145.

Wherefore, an early action on the merits is earnestly solicited.

Respectfully submitted,

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